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Abstract

Basic heat transfer and hydrodynamics studies in two-phase flow.

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A general survey is presented of the experimental work performed at CISE in the field of heat transfer and hydrodynamics of two-phase flow in forced convection. The main results are indicated and some correlations of the experimental data are given.

The main items are the following:

- Phase and velocity distribution.
- Pressure drop.
- Liquid volume fraction.
- Heat transfer.
- Heat transfer crisis.

The experiments were performed with upward flow in vertical conduits, and the annular-dispersed flow regime was mostly investigated.

Heat transfer data were collected with steam-water mixtures at high pressure (50 ÷ 90 kg/cm^2).

Most data on phase and velocity distribution, as well as on liquid volume fraction, were instead collected with two-component mixtures in adiabatic conditions at room temperature (pressure up to 22 kg/cm^2); however a limited number of experiments were carried out with heat transfer.

Pressure drop measurements were performed in all the experimental conditions

cited above, with and without heat transfer.

Round tubes were used for most experiments; however, more complicated geometries, such as annuli and clusters, were also investigated to some extent.

The influence of the hydrodynamic conditions at the inlet of the conduit and of the axial power distribution was also studied.

The experimental conditions with two-component mixtures were as follows:

Gas phase:	argon, nitrogen	Specific mass flowrate:		30 ÷ 300 g/cm^{2}s
Liquid phase:	water, ethyl alcohol	Quality:		0 ÷ I
Temperature:	I6 ÷ 40 °C	Round tubes	Diameter:	I.5 ÷ 2.5 cm
Pressure:	up to 22 kg/cm^2		Length:	I20 ÷ 350 cm

With steam-water mixtures, the explored range was:

Pressure:	50 ÷ 90 kg/cm^2	Round tubes	Diameter:	0.5÷2.5 cm
Specific mass flowrate:	I00 ÷ 400 g/cm^{2}s		Heated length:	2÷400 cm
Inlet quality:	-0.5 ÷ I			
Outlet quality:	above zero			

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